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CRIMSON CLOVER SEED.

Last year the Department issued a circular on the seed of crimson clover (*Trifolium incarnatum*), the greater part of which is reprinted in the present publication. Since issuing the circular this Division has received more than one hundred samples of crimson clover seed for test. The results of these tests have fully justified the fear that, unless care was taken to test the germination of the crimson clover seed, much poor stuff would be planted and disappointment would follow.

Crimson clover has been much praised and it has also been severely condemned. It is believed that the trouble has been largely with the quality of the seed planted. The demand has been so great that dealers have supplied whatever they could get, and the consequence has been a loss of the good name this clover made for itself when high-grade seed was used. As a general principle, seed should be used that was grown in the neighborhood where it is to be planted, or at least in a place having climatic conditions similar to those prevailing in the place where it is to be used. For instance, Ohio farmers would do well to sow Ohio-grown seed when possible, and farmers in the States north and west of Ohio would better use Ohio seed than that grown in Delaware or Maryland. As between imported seed and American-grown seed, the latter is to be preferred, whether raised in Ohio or Maryland. However, imported seed, if of good vitality, will generally give satisfaction south of the Ohio, while the plants might not always be hardy enough to endure the winter farther north.

Crimson clover has abundantly proved its value as a soil enricher, and if good seed is used failures will not be as common as heretofore.

THE SEED.

The seed of crimson clover is larger than that of red or mammoth clover and is almost perfectly oval in shape. The fresh seed is of a bright reddish yellow color and has a high polish. As the seed becomes older the color changes to a reddish brown, and eventually the polish is lost and the seed takes on a dull, dark reddish brown color. Such seed should never be purchased, as it is too old to grow.

In general the seed of crimson clover is less liable to contain weed seeds than the seed of other clovers. Being planted in late summer

or fall, it tends to choke out what weeds may come up with the young plants, and it is harvested in the spring before many weeds have matured their seed. In some cases, however, it contains the seeds of dangerous weeds, and farmers should be on their guard when purchasing. In a number of tests made at this laboratory the seeds of fifty weeds were found to be more or less frequently present. Most of these occurred but seldom and then only a few seeds in a sample, but sorrel, yellow trefoil, and mustard were found in 72 per cent of the samples. In the worst samples there were from 3,000 to 6,300 weed seeds per pound, while in one case there were 38,958 seeds of yellow trefoil per pound. The seeds of a species of geranium are not infrequently present. These are about the size and shape of crimson clover seeds, but lack polish and are marked with fine pits, which are at once evident when the seeds are examined with a low-power hand lens.

The most serious adulteration of crimson clover seed is that with Egyptian clover (*Trifolium alexandrinum*). It is stated that this is not uncommon in European seed, but so far we have not observed it in American samples. The seeds of Egyptian clover are of the same size as those of crimson clover, but in color they are more like clay and in form tend more to be egg-shaped. There are deeper lines on the edge where the rootlet can be seen outlined on the seed. In crimson clover this edge is about as smooth as the back, but in Egyptian clover there is a marked depression on each side of the rootlet.

The worst weed that can possibly get into a clover field is dodder. The seeds being small are seldom found in crimson clover seed, but they may be present in poorly cleaned lots and a lookout should always be kept for them. The seeds of dodder are small and gray and look like minute lumps of clay.

#### GERMINATION.

While crimson clover seed is comparatively pure, its germination often leaves much to be desired. This seed deteriorates rapidly with age and fresh seed should always be demanded; nor should an assurance of its being fresh be accepted, but a guarantee of a definite percentage of purity and germination should be demanded from dealers. Seedsmen always disclaim any warranty, and as a rule they oppose a guarantee, but there is no reason why clover seed of all kinds should not be guaranteed. The purity can be accurately determined and a simple germination test is all that is needed to determine the vitality of a given sample. Dealers can readily make their own germination tests, as many do now, and there is no excuse for the carelessness of some who sell seeds as they would nails, without the least knowledge of their quality.



Consumers should not only insist on a guarantee, but should test the germination of their seed whether guaranteed or not. This can easily be done at home by any one. The accompanying illustration (fig. 1) shows a simple homemade germinator. A piece of moist cloth (flannel is best) is laid on a plate, the seeds are placed between the folds of the cloth, and a second plate is inverted over the whole. A certain number of seeds, 100 or 200, should be carefully counted out, and the germinating ones removed and counted as fast as they appear. Germination will begin on the second day, and good seed ought to sprout 80 to 90 per cent in three days.

The importance of the germination test can not be too strongly urged. If preferred, it may be made in soil. In some respects this

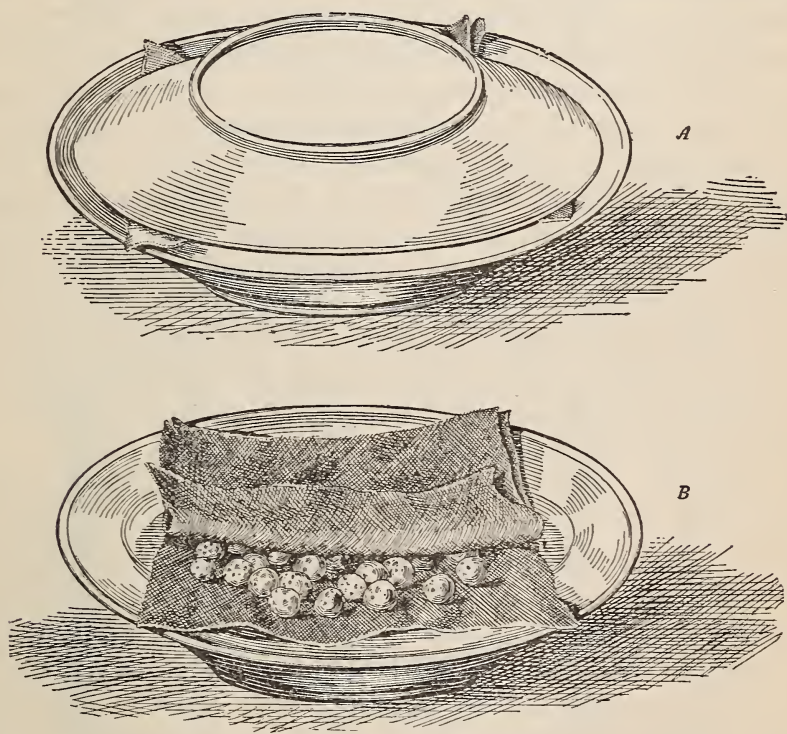


FIG. 1.—Simple germinating apparatus: *A*, closed; *B*, open.

is a better test, showing not only how many seeds will produce sprouts, but also how many will produce plants. The vigor of the plants can also be noted. The soil test, however, requires more time and is less convenient than the cloth test, and the latter will show the value of the seed if note is taken of the number that sprout after the third day and of those that make weak sprouts. Even though the percentage of germination during a ten-day test comes up to 80 or 90 per cent, if germination is slow and the sprouts weak the seed will not give satisfaction. Crimson clover seed germinates rapidly, and in most cases one or two days will be enough to determine whether the seed is fit for use.

Many of the failures with crimson clover are due to the use of old seed, which is often sold at a low price. This is discolored and will show poorer germination than fresh seed and produce weaker plants. Even fresh seed may, however, be of poor quality. The seed of crimson clover is not easy to harvest. The plants require to be cut when the seed is hard and ripe but not yet loosened from the plant. If wet weather follows cutting, or if the seed is not properly dried, it becomes discolored and may begin to sprout. If it is then dried and germination is checked, the vitality of the seed may be seriously injured. It is, therefore, never enough to say that a given sample is fresh, but the consumer should insist upon a guarantee and upon seed that will test 85 to 95 per cent.

During the months of August, September, and October of 1899 116 samples of crimson clover seed were tested in the Seed Laboratory of the Department of Agriculture. These had been purchased from most of the prominent seedsmen in the East and South, and probably fairly represented the quality of the seed sold last year. The samples were doubtless better than the average of the seed on the market, since many of them came from dealers of the highest reputation. Of the samples tested, one-third could be classed as good to excellent, one-eighth as poor to fair, and more than one-half as practically worthless. Of the third class about one-half would not have made a stand at all and the other half would have yielded about one-third of the normal number of plants, most of which would have perished in any but a mild winter.

The range of germination was from 99.75 per cent for the best sample to 0 for the poorest. The purity was in most cases good, though one sample sold as crimson clover proved to be common red clover. Wherever the source of the seed was certainly known it was found that American-grown seed was better than imported. Much that goes under the name of American grown is not American grown, however, and not all imported seed is bad. So far as we have been able to ascertain about one-third of the lots of crimson clover seed imported during the past spring and winter germinated well. The remainder were poor, about one-half being absolutely worthless. One lot of seed imported as crimson clover proved to be yellow trefoil.

The price of the samples tested during the past year bore no relation to the quality of the seed. Some of the poorest lots were sold at high prices, one sample, for which \$5.75 per bushel was asked, having in the chamber a germination of 1 per cent, while another sample for \$3.50 germinated 2 per cent. One sample for \$4.50 per bushel tested 98 per cent, and another for \$5.50 tested 99 per cent. While most of the good samples were sold by dealers with national reputations, some of the poorest samples also came from seedsmen



from whom better seed might be expected, and some of the smaller dealers sold seed whose quality was unsurpassed.

Purchasers of crimson clover seed should be willing to pay a fair price for good seed, but it is not possible at present to be certain of the quality of the seed even when a high price is paid. The only way to make sure is to buy the seed on a guarantee of germination and purity, and then to test the seed and thus ascertain whether the guarantee is fulfilled. The value of a sample of crimson clover seed depends upon the amount of pure and germinable seed it contains. Whatever else is present is worthless or worse than worthless. The value is, therefore, not always indicated by the selling price. The table below shows the price actually paid for a bushel of good seed of four samples, and in figures 2 and 3 are shown the amounts of good seed and waste in two of the samples given in the table:

*Comparison of market price of crimson clover seed with price actually paid for the good seed.*

Sample number.	Market price, per bushel.	Per cent good seed.	Number of pounds good seed per bushel.	Price paid per bushel of good seed.
1	\$5.75	0.82	0.49	\$703.80
2	5.50	97.5	58.5	5.64
3	4.75	48.36	29	9.72
4	4.50	90.49	54.29	5.04



FIG. 2 (sample 1 of table 1).—Crimson clover (*Trifolium incarnatum*): 1, one pound of seed as bought; 2, pure seed; 3, broken seed and dirt; 4, spurious seeds; 5, total waste; 6, pure and germinable seed.

## AMOUNT OF SEED TO USE PER ACRE.

The amount of seed per acre varies under different conditions. From 12 to 25 pounds has been recommended, but in most cases 15 to 20 pounds is about the quantity required. The amount needed will, of course, depend upon the quality; a sample that will give 90 per cent of strong sprouts will go further than one germinating less than 50 per cent. Seed in the husk is sometimes used and with good results in dry weather. When this is used a greater bulk is needed, say a bushel per acre.

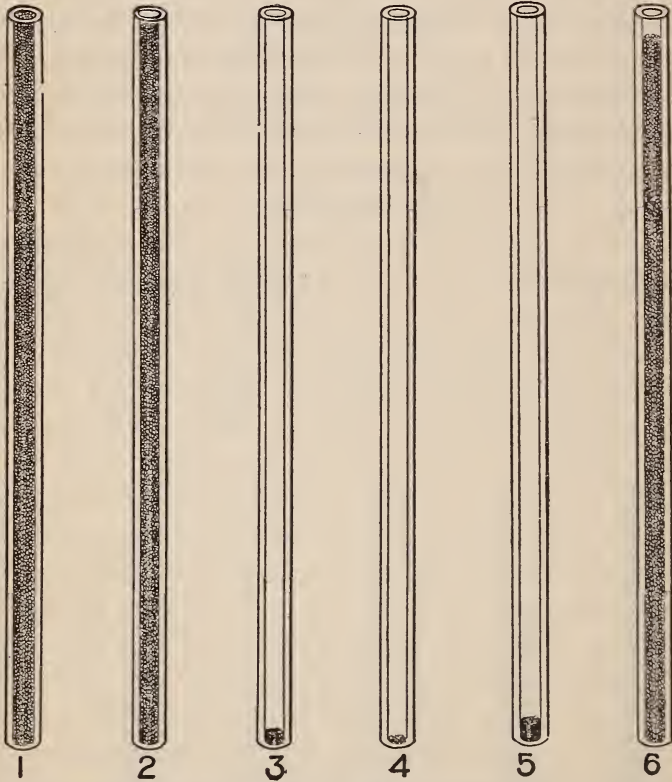


FIG. 3 (sample 2 of table 1).—Crimson clover (*Trifolium incarnatum*): 1, one pound of seed as bought; 2, pure seed; 3, broken seed and dirt; 4, spurious seed; 5, total waste; 6, pure and germinable seed.

## THE GUARANTEE.

The seedsman can not guarantee a crop. The yield depends on so many uncontrollable conditions that no seed however good can always produce a crop; but the dealer can guarantee the quality of the seed, and upon this consumers have a right to insist. This guarantee might be made good for three to six months, so that the seedsman would not be held responsible for deterioration of the seed by age after it leaves his hands.

In case of dispute the State experiment station or the U. S. Department of Agriculture should be asked to test the seed, and its report should be accepted by both parties. A guarantee will enable the



farmer to judge whether the price is fair. He can compare the price with the guaranteed value and purchase accordingly.

In making a guarantee the seedsman should agree that in case the seed sold does not come up to the guarantee he will either replace it with fresh seed, paying freight charges, or will refund a pro rata amount of the money paid for the seed, as the purchaser shall elect. The real value of a sample of seed is determined by multiplying the percentage of purity by the percentage of germination and dividing by 100. For example, if a sample is 98 per cent pure and

shows a germination of 90 per cent, its real value is  $\frac{98 \times 90}{100} = 88.2$  per cent. Again, if the purity is 98 per cent but the germination only 50 per cent, the real value will be 49 per cent. Expressing this in terms of pounds per bushel we have in the first case 52.92 pounds of pure and germinable seed in every bushel of 60 pounds and in the second case 29.4 pounds. If the seed was guaranteed to have a purity of 98 per cent and a germination of 90 per cent and the germination fell to 80 per cent on test, the amount of rebate would be 9.8 per cent of the purchase price.

The principal value of the guarantee lies not in the return of a small amount of money but in the assurance to the farmer that the seed he buys is good and that his time and labor will not be wasted.

#### SENDING SAMPLES TO THE DEPARTMENT OF AGRICULTURE.

The Seed Laboratory is making a special study of grass and forage plant seeds, and any sample sent in will be promptly tested and reported on. Farmers will find it to their advantage to send samples for test, giving names of dealers from whom purchased, price paid, and the guarantee, if any.

The sentiment against the sale of poor seed is growing, and it is to the interest of all concerned that fraudulent practices should be stopped or the perpetrators exposed when found out. If the Department can secure abundant samples of the crimson clover sold this season, especially in the South, it is possible that some advance may be made toward better seed. The guarantee, however, furnishes the key to the situation. If consumers will buy from responsible seedsmen and before purchasing insist upon a guarantee, there will be little possibility of trouble. The purchase of cheap seed, on the other hand, is frequently the reason why no stand is secured, or why the plants are too weak to winter over.

A. J. PIETERS,

*In Charge of Pure Seed Investigations.*

Approved:

JAMES WILSON,

*Secretary of Agriculture.*

WASHINGTON, D. C., July 20, 1900.

